<u>Success of a business depends on such factors as:</u>
- Customer relations
- Quality of product and service
- Time to market and lead time
- Price

<u>Price must be:</u>
- Low enough to attract customers
- High enough to cover operating expenses and make a profit

7.1) Markup on Cost

1. <u>**Recognize the terms used in selling**</u>

    <mark>Cost:</mark>
    - Price paid to supplier (manufacture or wholesaler) after trade discounts and cash discounts have been taken.
    - Shipping and Insurance costs are included.

    cost = Net cost (from earlier)

    <u>Selling Price:</u>
    - Price offered to customer

    Markup is what you add to to cost to get selling price

    <mark><u>Markup, "Margin", or "Gross Profit":</u></mark>

    Cost of Product + Markup = Selling price   *Formula*

    Selling Price – Cost = Markup   *Formula*

    <u>Operating Expenses or "Overhead":</u>
    - <u>Examples:</u>
        o Wages
        o Rent
        o Utilities
        o Insurance
        o Advertising
    <u>Net Earnings:</u>

    Total sales (Total Revenue)
    - Cost of Goods
    - <u>Operating Expenses</u>
    = Net Earnings or Net Profit

    Formula

Markup on Cost:
- Used by Manufacturers, wholesalers, and some retailers
- **Cost is the <u>base</u> on which to compare everything!**

Formulas are on next page →

Markup on selling price:
- Mostly used my Retailers
- Because most of their financial data are expressed as a percentage of sales
- ****Sell Price is the <u>base</u> on which to compare everything!**

2. **<u>Know the basic formula for markup</u>**

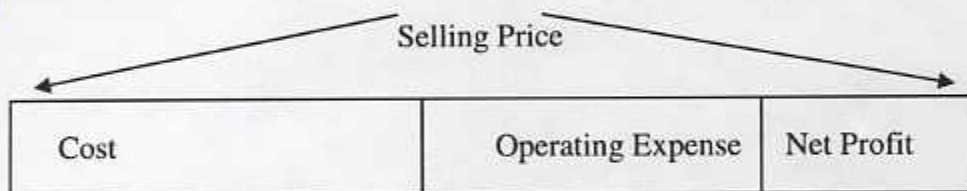**Cost + Markup = Selling price**

- This markup formula is used when markup is expressed as
  - A percentage of sales, or
  - A percentage of cost

<u>Other ways to arrange the first equation:</u>

1) Cost + Markup = Selling price

2) Selling Price – Markup = Cost

3) Selling Price – Cost = Markup

Selling Price

Cost	Operating Expense	Net Profit

Markup

(Both are added to get Markup)

Example:
If cost is $15 and selling price is $20, what is the mark up?

$$\$20 - \$15 = \$5 = Markup$$

Example:
If markup is $5 and selling price is $20, what is the cost?

$$\$20 - \$5 = \$15 = cost$$

Example:
If the cost is $15 and the mark up is $5, what is the selling price?

$$\$15 + \$5 = \$20 = selling\ price$$

Excel is Fun!

Math is Fun!

Rates

Markup on cost

100% Base

$$\% \text{ (markup on cost rate)} + \% = \%$$

cost $ + Markup + $ = Part

= sell price = $ = Part

Markup on **sell price**

$$\% \text{ (markup on sell price rate)} + \% = 100\%$$

Cost $ + Markup + $ = Part

= sell price = $ = Base

The only difference between the two is Base!!!!!!!!

cost always is base

MARKUP ON COST

$\frac{\$10.00}{\$10.00} = 1$ rate $\boxed{100\%}$

$\frac{\$5.00}{\$10.00} = .5$ rate 50%

$\frac{\$15.00}{\$10.00} = 1.5$ rate 150%

Cost $10.00 $\boxed{\text{base}}$

+ Markup $5.00 part

= Selling Price $15.00 part

This one formula will work for all Markup on cost prob

$15.00 - $5.00 = $10.00
$15.00 - $10.00 = $5.00
$10.00 + 5.00 = $15.00

* Manufactures use markup on cost to see what the "gross profit" is

Example $\frac{\$5.00}{\$10.00} = \frac{1}{2} = .5 \Rightarrow 50\%$ markup on cost or "gross profit"

"profit margin"

MARKUP ON SELLING PRICE

For markup on sell price always is base

$\frac{\$10.00}{\$15.00} = .\overline{66}$ $66\frac{2}{3}\%$ rate

$\frac{\$5.00}{\$15.00} = .\overline{33}$ $33\frac{1}{3}\%$ rate

$\frac{\$15.00}{\$15.00} = 1$ $\boxed{100\%}$ rate = selling price

Cost $10.00 part

+ Mark up $5.00 part

= Selling Price $15.00 $\boxed{\text{base}}$

This one formula will work for all markup on sell price

$15.00 - 5.00 = $10.00 sell price
$15.00 - 10.00 = $5.00
$10.00 + $5.00 = $15.00

(★) Retail Stores use Markup on selling price to see what part of every dollar is gross profit and what part is cost

Example $\frac{5}{15} = .\overline{33} \Rightarrow 33\frac{1}{3}$ cents on every dollar is gross profit

$\frac{10}{15} = .\overline{66}$ $66\frac{2}{3}$ cents on every dollar is cost

Example:

If cost of boomerang is $20 and the selling price is $30, find:
- Markup in dollars
- Percent of mark up based on cost
- Percent of sell price based on cost

Step 1: Set up formula

$$
\begin{array}{lll}
100\% & \text{cost} & \$20 \\
+ \% & + \text{markup} + \$ \\
\hline
= \% & = \text{sell price } \$30
\end{array}
\qquad
\begin{array}{l}
\text{Base} \\
+ \text{Part} \\
\hline
= \text{other part}
\end{array}
$$

100%	Cost	$20	Base
+%	+Markup	$	+Part
= %	=Sell Price	$30	=Part

**With just cost and sell price and the knowledge that cost = base = 100%, we can solve for all the rest!

Step 2: find mark up in dollars

$$\text{Sell price} - \text{cost} = \text{Markup}$$
$$\$30 - \$20 = \$10 \text{ Markup}$$

$$
\begin{array}{lll}
100\% & \text{cost} & \$20 \\
+ \% & + \text{Markup} + \$10 \\
\hline
= \% & = \text{sell price} = \$30
\end{array}
\qquad
\begin{array}{l}
\text{Base} \\
+ \text{Part} \\
\hline
= \text{Part}
\end{array}
$$

Sell Price – Cost = Markup

$30 - $20 = $10

100%	Cost	$20	Base
+%	+Markup	$10	+Part
= %	=Sell Price	$30	=Part

Step 3: Find % of mark up based on cost

$$\begin{array}{rl} & 100\% \\ + & \%\ \text{(circled)} \\ \hline = & \% \end{array} \qquad \begin{array}{l} \text{cost} \quad \$20 \\ + \text{Markup} \ \$10 \\ \hline = \text{sell price} \ \$30 \end{array} \qquad \begin{array}{l} \text{base} \\ + \text{Part} \\ \hline = \text{Part} \end{array}$$

$$\frac{P}{B} = R = \frac{\text{Markup}}{\text{cost}} = \frac{\$10}{\$20} = \frac{1}{2} = .5 \Rightarrow 50\%$$

Compare \$10 to \$20 – what percent of \$20 is \$10?
\$20 = cost = base
\$10 = mark up = part

$$\left(\begin{array}{l} \text{Markup on} \\ \text{cost} \\ \text{Rate} \end{array} \right) \rightarrow$$

Formula for rate:

Rate = Part/Base

$10/$20 = ½ = .5 = 50%

$$\begin{array}{l} 100\% \\ \underline{+50\%} \\ = \% \end{array} \quad \begin{array}{l} \text{Cost} \quad \$20 \\ \underline{+\text{Markup} \ \$10} \\ =\text{Sell Price} \ \$30 \end{array} \quad \begin{array}{l} \text{Base} \\ \underline{+\text{Part}} \\ =\text{Part} \end{array}$$

$$\begin{array}{rl} & 100\% \\ + & 50\% \\ \hline = & \%\ \text{(circled)} \end{array} \qquad \begin{array}{l} \text{cost} \quad \$20 \\ + \text{Markup} \ \$10 \\ \hline = \text{sell price} \ \$30 \end{array} \qquad \begin{array}{l} \text{Base} \\ + \text{Part} \\ \hline = \text{Part} \end{array}$$

Step 4: Find % of sell price based on cost

$$100\% + 50\% = 150\%$$

$$\begin{array}{rl} & 100\% \\ + & 50\% \\ \hline = & 150\% \end{array} \qquad \begin{array}{l} \text{Cost} \quad \$20 \\ + \text{Markup} \ + \$10 \\ \hline = \text{sell price} = \$30 \end{array} \qquad \begin{array}{l} \text{Base} \\ + \text{Part} \\ \hline = \text{Part} \end{array}$$

$$\begin{array}{l} 100\% \\ \underline{+50\%} \\ =150\% \end{array} \quad \begin{array}{l} \text{Cost} \quad \$20 \\ \underline{+\text{Markup} \ \$10} \\ =\text{Sell Price} \ \$30 \end{array} \quad \begin{array}{l} \text{Base} \\ \underline{+\text{Part}} \\ =\text{Part} \end{array}$$

From our 2 numbers 20, 30 we solved for everything

- **You have solved for everything!
- Formula can be used to solve all these problems.

Example 3:
- Markup on a basketball is $14.00
- Markup on cost is 50%
- Find the cost
- Find the Sell price

Rates

$$100\%$$
$$+ 50\%$$
$$= \quad \%$$

1st SET UP

$$
\begin{array}{cccc}
 & C & & \text{Base} \\
+ M & \$14 & + \text{Part} \\
\hline
= S & = \text{Part}
\end{array}
$$

2nd solve & plug numbers in

$$\frac{P}{R} = B = cost = \frac{14}{.5} = \$28 \; cost$$

$$C + M = S = 28 + 14 = \$42 \quad sell\,price$$

cost
Rate + Markup on cost Rate = Rate = $100\% + 50\% = 150\%$

$$
\begin{array}{cccc}
100\% & C & \$28 & \text{Base} \\
+ 50\% & + M & \$14 & + \text{Part} \\
\hline
= 150\% & = S & = \$42 & = \text{Part}
\end{array}
$$

100%	Cost	$28	Base
+ 50 %	+ Markup	$14	+ Part
= 150%	= Sell Price	$42	= Part

Example 4:
- Financial calculator cost is $23.60
- The markup on cost is 25%
- Find the markup
- Find Selling price

step 1

Rates

$$100\%$$
$$+ 25\%$$
$$= \quad \%$$

$$C$$
$$+ M$$
$$= S$$

$$+ \$$$
$$= \$$$

\$ 23.60 Base
$$+ \text{Part}$$
$$= \text{Part}$$

step 2

$$B * R = P = 23.60 * .25 = \$5.90 = Markup$$

$$C + M = S = 23.60 + 5.90 = \$29.50 = Sell\ Price$$

$$C.R. + \overset{Markup}{\underset{Rate}{\underset{Cost}{ON}}} = S.P.R. = 100\% + 25\% = 125\%$$

$$100\%$$
$$+ \quad 25\%$$
$$= 125\ \%$$

$$C$$
$$+ M$$
$$= S$$

\$ 23.60 Base
$$+ \$ \ 5.90 + Part$$
$$= \$ \ 29.50 = Part$$

100%	Cost	$23.60	Base
+ 25 %	+ Markup	$5.90	+ Part
= 125%	= Sell Price	$29.50	= Part

Example 5:
- Baseball glove selling price is $42.00
- The sell price as a percent of cost is 140%
- What is the cost of the baseball glove?

$$100\% \qquad C \qquad \$ \qquad Base$$
$$+ \quad \underline{\quad\%\quad} \qquad \underline{+ M} \qquad \underline{+\$} \qquad \underline{+ Part}$$
$$= 140\% \qquad = S \qquad = \$42.00 \qquad = Part$$

step 2

$$\frac{P}{R} = B = \frac{42}{1.40} = \$30 = Cost$$

$$S - C = M = 42 - 30 = \$12 = Markup$$

$$\left\{\begin{array}{c}Sell\ price \\ Rate\end{array}\right\} - \left\{\begin{array}{c}Markup \\ ON \\ Cost \\ Rate\end{array}\right\} = \left\{\begin{array}{c}Cost \\ Rate\end{array}\right\} = 140\% - 100\% = 40\%$$

$$100\% \qquad C \qquad \$30.00 \qquad Base$$
$$+ \; 40\% \qquad + M \qquad +\$ \; 12.00 \qquad + Part$$
$$= 140\% \qquad = S \qquad = \$42.00 \qquad = Part$$

100%	Cost	$30	Base
+ 40 %	+ Markup	$12	+ Part
= 140%	= Sell Price	$42	= Part

1. Understand the phrase "markup based on selling price"

Markup on selling price:
- We are going to be talking about percentages
- Why percentages: because you can compare across businesses and industries
- Mostly used my Retailers – because most of their financial data are expressed as a percentage of sales
- Sell Price is the base on which to compare everything

2. Solve markup problems when selling price is the base

- Same formula as before except we change which number we call the base
- The number we compare everything to changes
- Sell Price is the base on which to compare everything

Base is sell price

$$\% \quad C \quad \$$$
$$+ \quad + M \quad + \$$$
$$100\% \quad = S \quad =$$

Part + Part = Base

Rate	%	Cost	$	Part	Part
Rate	+%	+Markup	$	+Part	Part
	=100%	=Sell Price	$	=Base	

Markup based on Sell price
Sell Price Always base!!

*You can use this formula for most problems – solve for $ amounts, solve for % amounts
** If you know what is the base, or "starting point" you can figure most things out from there.

Base is sell price

Example:

If the cost of boomerang is $20 and the selling price is $30, find:

- Markup in dollars
- Percent of mark up based on sell price
- Percent of cost based on sell price

Step 1: Set up formula

$$+ \quad \frac{\% \quad \%\left(\substack{\text{markup on}\\\text{sell price Rate}}\right)}{100\%} \quad \begin{aligned} C \\ + M \\ \hline = S \end{aligned} \quad \begin{aligned} \$20 \\ + \$ 10 \\ \hline = \$ 30 \end{aligned} \quad \begin{aligned} \text{Part} \\ + \text{Part} \\ \hline = \text{Base} \end{aligned}$$

%	Cost	$20	Part
+%	+Markup	$	+Part
=100%	=Sell Price	$30	=Base

**With just cost and sell price and the knowledge that sell price = base = 100%, we can solve for all the rest!

Step 2: find mark up in dollars

$$S - C = M = \overset{\$}{30} - \overset{\$}{20} = \overset{\$}{10} = \text{Markup}$$

Sell Price – Cost = Markup

$30 - $20 = $10

%	Cost	$20	Part
+%	+Markup	$10	+Part
=100%	=Sell Price	$30	=Base

Step 3: Find % of mark up based on sell price

Formula for rate: Rate = Part/Base

$$R = \frac{P}{B} = \frac{20}{30} = \frac{2}{3} = .\overline{33} = 33\frac{1}{3}\%$$

$$\boxed{66\frac{2}{3}\%}$$
$$+ \boxed{33\frac{1}{3}\%}$$
$$= \ 100\%$$

$$\begin{array}{lll} & C & \$20 \quad \text{Part} \\ + & M & +\$10 + \text{Part} \\ \hline & = S & = \$30 = \text{Base} \end{array}$$

$30 = sell price = base
$10 = mark up = part
$10/$30 = 1/3 = .333 = 33 1/3%

%	Cost	$20	Part
+33 1/3%	+Markup	$10	+Part
=100%	=Sell Price	$30	=Base

Step 4: Find % of cost based on sell price

$$100\% - 33\frac{1}{3}\% = \boxed{66\frac{2}{3}\%}$$

$\left\{\begin{array}{l}\text{Markup on}\\ \text{sell price Rate}\end{array}\right\}$

$\left\{\begin{array}{l}\text{cost as a percentage}\\ \text{of sell price}\end{array}\right\}$

Sell price % - Markup % = Cost %

100% - 33 1/3% = 66 2/3%

OR

$$100\% - 33.33\% = 66.67\%$$

66 2/3%	Cost	$20	Part
+33 1/3%	+Markup	$10	+Part
=100%	=Sell Price	$30	=Base

**You have solved for everything!

Page 284 in 11th edition

3. Use the markup formula to solve variations of markup problems

Example 2:
- Three ring binder has a ==markup of $1.72==
- The $1.72 is a markup on selling price equal to ==35%==
- Find the cost of the binders
- Find the sell price for the binders

$$\text{step 1}$$

$$
\begin{array}{ccc}
65\% & C & \$\,3.19 & \text{Part} \\
+\,35\%\ {\tiny\begin{array}{c}\text{markup on}\\ \text{sell price}\\ \text{Rate}\end{array}} & +\,M & +\,\$\,1.72 & +\,\text{Part} \\
\hline
=100\% & = S & = 4.91 & = \text{Base}
\end{array}
$$

$$B = \frac{P}{R} = \frac{\text{Markup \#}}{\begin{array}{c}\text{Markup on}\\ \text{sell price}\\ \text{Rate}\end{array}} = \frac{1.72}{.35} = 4.91428 \approx 4.91$$

Round to here (penny)

$$\frac{\text{}}{\text{}} \text{Sell Price}$$

$$S - M = C = 4.91 - 1.72 = 3.19 = \text{cost}$$

$$\left\{\begin{array}{c}\text{cost as a}\\ \%\ \text{of}\\ \text{sell price}\end{array}\right\} = 100\% - \left\{\begin{array}{c}\text{Markup on}\\ \text{Cost}\\ \text{Rate}\end{array}\right\} = 100\% - 35\% = 65\%$$

%	Cost	$C	Part
+ %	+ Markup	+ $1.72	+ Part
= 100%	= Sell Price	= $S	= Base

Example 4:
- Cost of jogging shorts equal $9.15
- The markup on sell price is 25%
- Find the markup

$$75\% $$
$$+ 25\% $$
$$= 100\%$$

$$C \qquad \$ \; 9.15 \quad \text{Part}$$
$$+ M \qquad + \$ \; 3.05 \quad + \text{Part}$$
$$= S \qquad = 12.20 = \text{Base}$$

$$100\% - 25\% = 75\%$$

$$\frac{P}{R} = B. = \text{Sell Price} = \frac{Cost}{\frac{Cost}{Rate}} = \frac{9.15}{.75} = \$ \; 12.20.00$$

$$12.20 - 9.15 = 3.05$$

%	Cost	$9.15	Part
+ 25%	+ Markup	+ $M	+ Part
= 100%	= Sell Price	= $S	= Base

$$12 \text{ of } 25$$

4. Determine percent markup on cost and the equivalent percent markup on selling price

- Sometimes markup based on cost must be compared to markup based on sell price.
-

Example:

- A manufacturer must understand what they use:
    - o   mark up based on cost
- While at the same time they must understand what the retailers use:
    - o   markup based on sell price

Next pages   →

Example:
A small motor company sells to both manufacturers who makes compressors and to a retailer who sells the motors to consumers. If the cost of motor is $50 and the selling price is $75, find:
- percent of mark up based on cost
- percent of markup based sell price

Step 1: Find the % of mark up based on cost

100%

$+50\%$

$=150\%$

C $\$50$ Base

$+M$ $+\$25$ $+$ Part

$=S$ $=\$75$ $=$ Part

$M = S - C = 75 - 50 = \$25 = $ Markup

$\left\{\begin{array}{c}\text{Markup on}\\\text{cost}\\\text{percentage}\end{array}\right\} = \dfrac{P}{B} = \dfrac{\text{Markup}}{\text{cost}} = \dfrac{25}{50} = \dfrac{1}{2} = .5 \Rightarrow 50\%$

$100\% + 50\% = 150\%$

100%	Cost	$50	Base	← Cost is the base!!
+%	+Markup	$	+Part	
= %	=Sell Price	$75	=Part	

100%	Cost	$50	Base	first
+%	+Markup	$25	+Part	
= %	=Sell Price	$75	=Part	

second →

100%	Cost	$50	Base
+50%	+Markup	$25	+Part
= %	=Sell Price	$75	=Part

Markup on cost = 50%

Excel is Fun!

Math is Fun!

Example:

A small motor company sells to both manufacturers who makes compressors and to a retailer who sells the motors to consumers. If the cost of motor is $50 and the selling price is $75, find:
- percent of mark up based on cost
- percent of markup based sell price

Step 1: Find the % of mark up based on cost

$$100\%$$

$$+ 50\%$$

$$= 150\%$$

$$C \qquad \$50 \qquad Base$$

$$+ M \qquad + \$ 25 \qquad + Part$$

$$= S \qquad = \$ 75 \qquad = Part$$

$$M = S - C = 75 - 50 = \$25 = Markup$$

$$\left\{ \begin{array}{c} Markup\ on \\ Cost \\ Percentage \end{array} \right\} = \frac{P}{B} = \frac{Markup}{Cost} = \frac{25}{50} = \frac{1}{2} = .5 \Rightarrow 50\%$$

$$100\% + 50\% = 150\%$$

100%	Cost	$50	Base	← Cost is the base!!
+%	+Markup	$	+Part	
= %	=Sell Price	$75	=Part	

100%	Cost	$50	Base	first
+%	+Markup	$25	+Part	
= %	=Sell Price	$75	=Part	

second →

100%	Cost	$50	Base
+50%	+Markup	$25	+Part
= %	=Sell Price	$75	=Part

Markup on cost = 50%

Step 2: Find the % of markup based sell price

$$C \quad \$ \quad 50 \qquad Part$$
$$+ M \quad +\$ \quad \boxed{25} \quad + Part$$
$$= S \quad = \$ \quad 75 \quad = Base$$

Left side:
$$+\ 33\tfrac{1}{3}\%$$
$$100\%$$

$$M = S - C = 75 - 50 = 25$$

$$\left\{\begin{array}{l}\text{Markup on} \\ \text{sell price} \\ \text{percent}\end{array}\right\} = \frac{P}{B} = \frac{Markup}{sell\ price} = \frac{25}{75} = \frac{1}{3} = 33.\overline{33}$$

or
$$33\tfrac{1}{3}$$
or
$$33.33\%$$
or
$$33\tfrac{1}{3}\%$$

%	Cost	$50	Part
+%	+Markup	$	+Part
=100%	=Sell Price	$75	=Base

Sell price is base

%	Cost	$50	Part
+%	+Markup	$25	+Part
=100%	=Sell Price	$75	=Base

first

%	Cost	$50	Part
+331/3%	+Markup	$25	+Part
=100%	=Sell Price	$75	=Base

second

See table at bottom of Page 274

$25/$50 = 1/3 → Markup on sell price is 33 1/3%.

Conclusion: If markup on cost percent is 50%, then Markup on cost % is 33⅓%.

Remember: going up always larger than going down: notes from chapter 3

Increase:

Sales went from $10,000 to $20,000 in one year. Find the percentage increase.

Beginning point = $10,000
Ending point = $20,000

Amount of change = End point – Beginning point = $20,000 - $10,000

= $10,000

Beginning point = $10,000   = Base
Amount of change = $10,000   = Part
Rate of Change = ?   = Rate

Rate of change = % increase = Rate = Part/Base = 10000/10000 = 1.0 =100%

"100% increases in sales."

Decrease:

Sales went from $20,000 to $10,000 in one year. Find the percentage decrease.

Beginning point = $20,000
Ending point = $10,000

Amount of change = End point – Beginning point = $10,000 - $20,000
= -$10,000

Beginning point = $20,000   = Base
Amount of change = -$10,000   = Part
Rate of Change = ?   = Rate

Rate of change = % decrease = Rate = Part/Base = -10000/20000 = -.5 = -50%

"50% decrease in sales."

Illustrates the fact that % increases on the way up are large while similarly sized "number" decreases on the way down are much smaller.

(27) Find the percent [markup] base on [selling price] and [cost] if an electric oven costing $336 is sold for $480.

(1st) List variables and details

item sold = electric oven   Find $\dfrac{Markup}{Cost}$

cost = $336.00

selling price = $480.00   find $\dfrac{Markup}{Selling\ Price}$

(2nd) set up & solve

$\dfrac{336}{336} = 1$ 100%   %   Cost $ 336   base

$\dfrac{144}{336} \approx .42857$ 42.86% %+   Markup $ 144   part   480 - 336 = 144

$\dfrac{480}{336} \approx 1.42857$ 142.86 % % =   selling price $ 480   Part

or   1 + .42857 = 1.42857

or   1 - .3 = .7

$\dfrac{336}{480} = .7$ 70   % Cost $ 336   part

$\dfrac{144}{480} = .3$ 30   % + Markup $ 144   part   480 - 336 = 144

$\dfrac{480}{480} = 1$ 100% % =   selling Price $ 480   base

(3rd) write answer in words

Answer

For the electric oven Markup on selling price

is $\dfrac{144}{480} = .3 \Rightarrow 30\%$ and the Markup

on cost is $\dfrac{144}{336} \approx .42857 \Rightarrow 42.86\%$. The

difference between the 2 calculations is the base !!

$$\frac{\% \text{ Markup on cost}}{100\% + \% \text{ Markup on cost}} = \left\{ \begin{array}{c} \% \text{ Markup on} \\ \text{selling price} \end{array} \right\}$$

==Convert markup on selling price to markup on cost==

$$\frac{\% \text{ Markup on selling Price}}{100\% - \% \text{ Markup on selling Price}} = \left\{ \begin{array}{c} \% \text{ Mark up on} \\ \text{cost} \end{array} \right\}$$

Why are these formulas above true? ↑

Deductive Algebra proof →

==Not required to Know this==

☐ 1

$$\text{cost} = C$$
$$\text{selling price} = SP$$
$$\frac{\text{selling price}}{\text{selling price}} = 1 \quad \text{or} \quad 100\%$$

$M = \text{Markup}$

(1st)

$$\frac{C}{SP} + \frac{M}{SP} = 100\%$$

subtract $\frac{M}{SP}$ both sides

$$\frac{C}{SP} = 100\% - \frac{M}{SP}$$

exchange extremes & means

$$\frac{SP}{C} = \frac{1}{100\% - \frac{M}{SP}}$$

Multiply both sides by M/SP

$$\frac{M}{C} = \frac{M/SP}{100\% - M/SP} \qquad \checkmark$$

(2nd)

$$100\% + \frac{M}{C} = \frac{SP}{C}$$

exchange extremes & means

$$\frac{1}{100\% + \frac{M}{C}} = \frac{C}{SP}$$

multiply each side by M/C

[2]
$$\frac{M/C}{100\% + M/C} = \frac{M}{SP} \qquad \checkmark$$

This is **Why** the formulas are true
Not required to know this

Examples:

Convert 25% mark up on cost to the equivalent mark up on sell price

$$\text{Markup on cost percent} = 25\% \text{ or } .25$$

$$\text{Formula} = \frac{\text{Markup on cost } \%}{1 + \text{Markup on cost } \%} = \left\{\text{Markup on sell price } \%\right\}$$

$$\left\{\begin{array}{c}\text{Markup on} \\ \text{sell price} \\ \%\end{array}\right\} = \frac{.25}{(1+.25)} = \frac{.25}{1.25} = \frac{1}{5} = .2 \Rightarrow 20\%$$

% Markup on sell price = % markup on cost/(100% + % markup on cost)
% Markup on sell price = 25%/(100% + 25%) = .25/1.25 = 1/5 = 20%

Examples:

Convert 20% mark up on sell price to the equivalent mark up on cost

$$\left\{\begin{array}{c}\text{Markup on sell} \\ \text{price } \%\end{array}\right\} = .20 \text{ or } 25\%$$

$$\left\{\begin{array}{c}\text{Mark up on} \\ \text{Cost} \\ \%\end{array}\right\} = \frac{\text{Markup on sell price } \%}{(1 - \text{Markup on sell price } \%)}$$

$$\left\{\begin{array}{c}\text{Markup on} \\ \text{cost} \\ \%\end{array}\right\} = \frac{.2}{1-.2} = \frac{.2}{.8} = \frac{1}{4} = .25 \Rightarrow 25\%$$

% Markup on cost = % Markup on sell price /(100% - % Markup on sell price)
% Markup on cost = 20%/(100% -20%) = .20/.8 = ¼ = .25 = 25%

Example of common mark ups on cost and selling price, middle of page ~~270~~ 274

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6. Find the selling price for perishables

If Big D's Bakery makes 100 dozen doughnuts per day at a cost of $2.50 per dozen, and 7.00% of the doughnuts get donated to a non-profit, what is the sell price per dozen if the desired Markup on sell price is 55%?

Step 1

$$\begin{array}{ccc} \boxed{45}\,\% & C & \$\,250 \\ +\;\;\; 55\;\% & +\;M & +\;\$ \\ \hline =\;100\,\% & =\;S & =\;\$\,555.56 \end{array} \qquad \begin{array}{c} \text{Part} \\ +\;\text{Part} \\ \hline \text{Base} \end{array}$$

total cost $= 2.5 * 100 = 250$

$\left\{\begin{array}{c}\text{cost as a }\% \\ \text{of sell price}\end{array}\right\} = 100\% - 55\% = \boxed{45\%}$

$$\$ = \frac{P}{R} = \frac{cost}{Rate} = \frac{250}{.45} = 555.55\overline{5} \approx 555.56$$

Round to here

Step 2 Find # of Dozen made

$\left\{\begin{array}{c}\% \text{ of Dozen made} \\ \text{that will sell}\end{array}\right\}$ $100\% - 7\% = 93\% \Rightarrow .93$

# of Dozen sold $= .93 * 100 = 93$

Step 3 Find price per dozen

$$\text{price per dozen} = \frac{\text{total sell price}}{\text{\# of dozen sold}} = \frac{555.6}{.93} = 5.97376344 \approx 5.97 \text{ per dozen}$$

Round to penny

The price per dozen is $5.97

7.3) Markdown

- Markdowns are used to stimulate sales
- When sales are slow markdowns reduce the price
- Lower prices are used to attract more customers and to increase total sales.
- Slow sales can be caused by such factors as:
  o Weather
  o Retailer ordered to many goods to begin with
  o Competitors lowered prices
  o Odd sizes or colors may be left
  o Changes in fashions
  o Seasonal changes
  o Economic downturns

1. **Define the term markdown when applied to selling**

$$\text{Markdown} = \left\{ \begin{array}{c} \text{original} \\ \text{price} \end{array} \right\} - \left\{ \begin{array}{c} \text{Reduced} \\ \text{price} \end{array} \right\}$$

or

$$\{ \text{sale price} \}$$

or

$$\left\{ \begin{array}{c} \text{Actual} \\ \text{selling} \\ \text{price} \end{array} \right\}$$

Reduced price = original price – markdown
Markdown = original price – reduced price

$$\begin{array}{lll}
100\% & \# \text{original price} & \text{Base} \\
- \% \left(\begin{array}{c} \text{Markdown} \\ \text{percent} \end{array} \right) & - \# \text{markdown from original price} & - \text{Part} \\
= \% \left(\begin{array}{c} \text{Reduced} \\ \text{price} \\ \% \end{array} \right) & = \# \text{Reduced Price} & = \text{Part}
\end{array}$$

100%	$Original Price	Base
- % Markdown on Original price	-$Markdown from original price	- Part
=% Reduced price on original price	= $Reduced price	= Part

**With this formula:
If you have any two figures on one side and any one on the other side you can solve for all numbers.

Sell price after markdown:
- Sale price
- Reduced price
- Actual sale price

2. Calculate markdown, reduced price, and percent of markdown

Example:
The original price of a parka is $116.00. If the markdown is 30%, what is the reduced price?

Step 1: plug the numbers into the formula

$$100\%$$
$$-30\%$$
$$= 70\%$$

original price ⟵ #116   Base
− # markdown   − Part
──────────────────────────────────────
= # Reduced Price   81.20 = Part

100%	$116	Base
- 30%	- $Markdown	- Part
= %	= $Reduced price	=Part

Step 2: Solve for the % reduced price on Original price

$$100\% - 30\% = 70\%$$

100%	$116	Base
- 30%	- $Markdown	- Part
=70 %	= $Reduced price	=Part

Step 3: Solve for reduced price

$$B * R = P = \left\{ \begin{array}{c} original \\ price \end{array} \right\} * \left\{ \begin{array}{c} Redued \\ Price \\ Rate \end{array} \right\} = 116 * .70 = 81.2000$$

$$= {}^{\$}81.20$$

Original price x % Reduced price on original price = Reduced price
$116 x .7 = $81.20

Example:
If a raincoat is sold at the reduced price of $18 after a 40% markdown, what was the original price?

Step 1: plug the numbers into the formula

100%

$-\ 40\ \%$

$=\ \boxed{60\%}$

$\$$ original price $\$$ $\boxed{30^{00}}$ Base

$-\ \$$ Mark down $\$$ $-$ Part

$=\ \$$ Reduced Price $\$$ 18 $=$ Part

100%	$Original price	Base
- 40%	- $Markdown	- Part
= %	= $18	=Part

$\underline{\text{2 on this side}}$ | $\underline{\text{1 on this side}}$ $\underline{\text{so we can find all the rest of the numbers}}$ | ✱ Key!!!

Step 2: solve for % of reduced price on original price

$100\% \quad -\ 40\ \% = \boxed{60\ \%}$

100%	$ Original price	Base
- 40%	- $Markdown	- Part
= 60%	= $18	=Part

Step 3: Solve for original price

$$\frac{P}{R} = B = \frac{Reduced\ Price}{Reduced\ Price\ Rate} = \frac{\$18}{.6} = \boxed{\$30^{.00}}$$

Original price = base = part/rate = $18/.6
Original price = $30.00

30) A retailer sells an oak desk for $828.20 after deducting 18% from the original price. (Markdown). Find the original price.

==**1st** List variables and details==

oak desk price = $828.20

Markdown % = 18%

Find original price.

==**2nd** set up and solve==

==Markdown==

==| 100 % | original price | base |==
==| % = | reduced price | part 828.20 |==
==| 18 % = | Markdown | part |==

1) $100\% - \left(\dfrac{\text{reduced price}}{\text{original price}}\right)\% = 18\%$

$100\% - 18\% = \left(\dfrac{\text{reduced price}}{\text{original price}}\right)\%$

$= 82\% = .82$

2)
$.82 = \dfrac{\text{reduced price}}{\text{original price}} \implies \dfrac{828.20}{\text{original price}} = \dfrac{.82}{1}$

proportions are allowed to exchange "means"

$\implies \dfrac{828.20}{.82} = \dfrac{\text{original price}}{1}$

$\implies$ original price = $1010

==check== $1010 - (1010 * .18) = 828.2$ ✓

==**3rd** write in words==

Answer ___The original price was $1010.___

3. **Define the terms associated with loss. Determine the break-even point and operating.**
    Determine the amount of a gross or absolute loss.

What happens if you mark the item down too much?
- Reduced net profit
- No profit   (breakeven – total cost and expenses = price)
- Operating loss   (reduced price is less than the breakeven point)
- Absolute loss   (reduced price is below what it cost you)

(R. sell price) = Reduced sell price

$ Cost	$ operating expense	$ Net profit

Absolute loss point ⟶   Breakeven point

➤R. sell price ⟶ Absolute loss ⟶

➤R. sell price ⟶ Operating loss ⟶

➤R. sell price ⟶ Reduced Profit

➤Original sell price

Absolute
Loss
Point

- Absolute Loss Point = Cost
- Breakeven Point = Cost + Operating Expenses
- Absolute Loss = Cost – Reduced Sell Price
- Operating Loss = Breakeven Point – Reduced Selling Price
- Reduce Profit = Original Sell Price – Reduced Selling Price
- Net Profit = Original Selling Price – Breakeven Point

Example:

Bay Air paid $40 for a motor. If the operating expenses are 30% of cost and the reduced selling price was $50, what is the amount of profit or loss?

$$Cost = \$40$$

$$operating \ expense = 30\% * \$40 = \$12$$

Cost = 40   operate cost = 12

52
Reduced sell price 50

Step 1: Find cost and operating expenses

Cost of motor = $40
Operating expenses = 30% of motor = 30% of $40 = .3 x $40 = $12

Step 2: Find breakeven point to determine what sort of loss it is.

$$Breakeven \ point = 40 + 12 = \$52$$

Breakeven Point = Cost + Operating Expenses = $40 + $12 = $52

Step 3: Is breakeven greater than reduce sell price?

$$Break \ even = 52 > Reduced \ sell \ price = 50$$

$52 > $50, yes breakeven is greater than reduced sell price, so looking at the diagram I can tell that there is an operating loss.

Step 4: Determine operating loss

$$52 \qquad - \qquad 50 \qquad = -2$$

Break even point   Reduced price   Operating Loss

Operating Loss = Breakeven Point – Reduced Selling Price = $52 - $50 = $2.00

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